Impact of Ambient Aerosol Size Distributions and Convective Strength on Ice Size Distributions in Cumulonimbus Anvils

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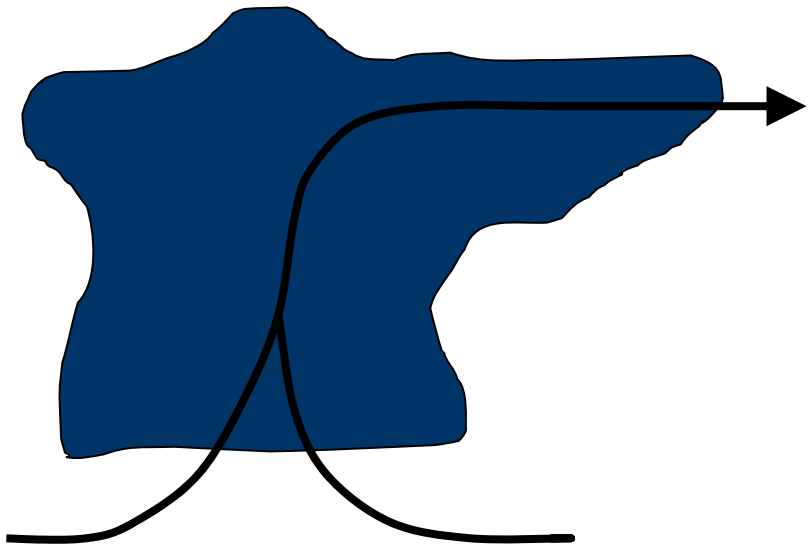
Outline

- Relationship between the Boundary Layer and the Anvil
- Observations during CRYSTAL/FACE
- Simulations of Deep Convection
- Comparison of Observations and Simulations
- Conclusions

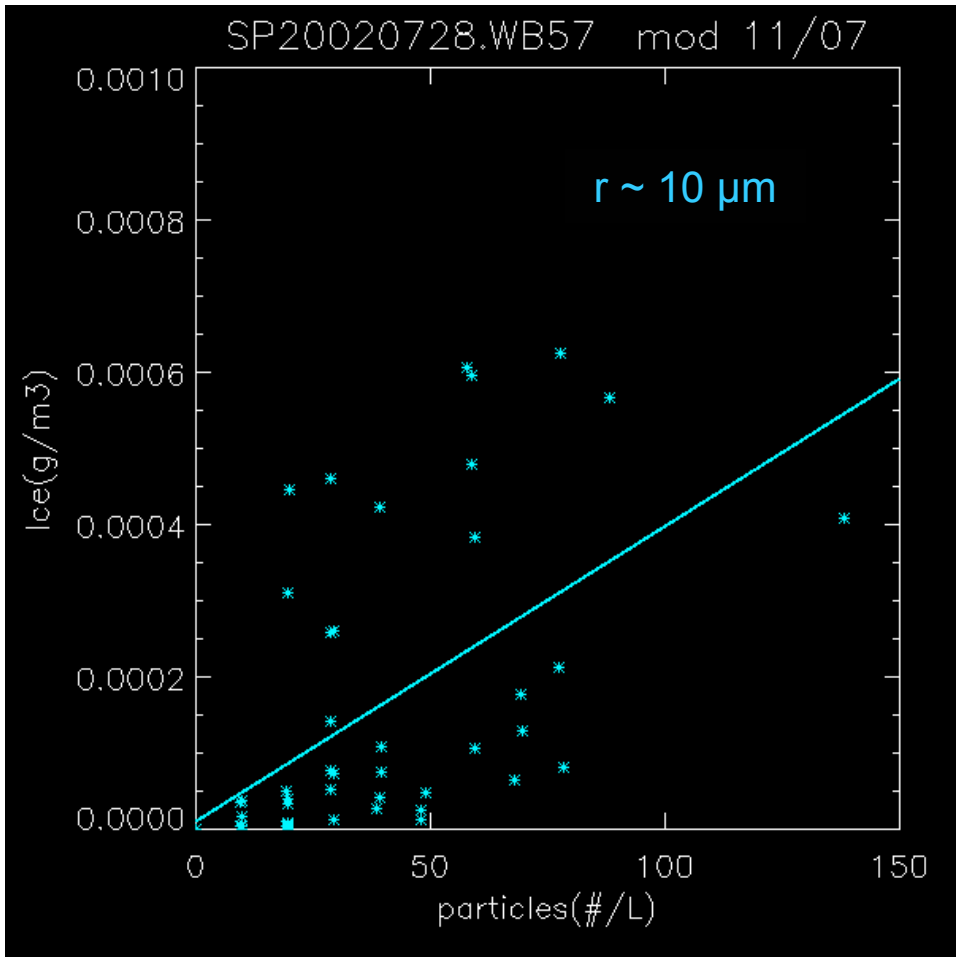
The Boundary Layer and The Anvil



Δq_v, O_3, F_{IR}, F_{SW}, τ

?

Data WB57



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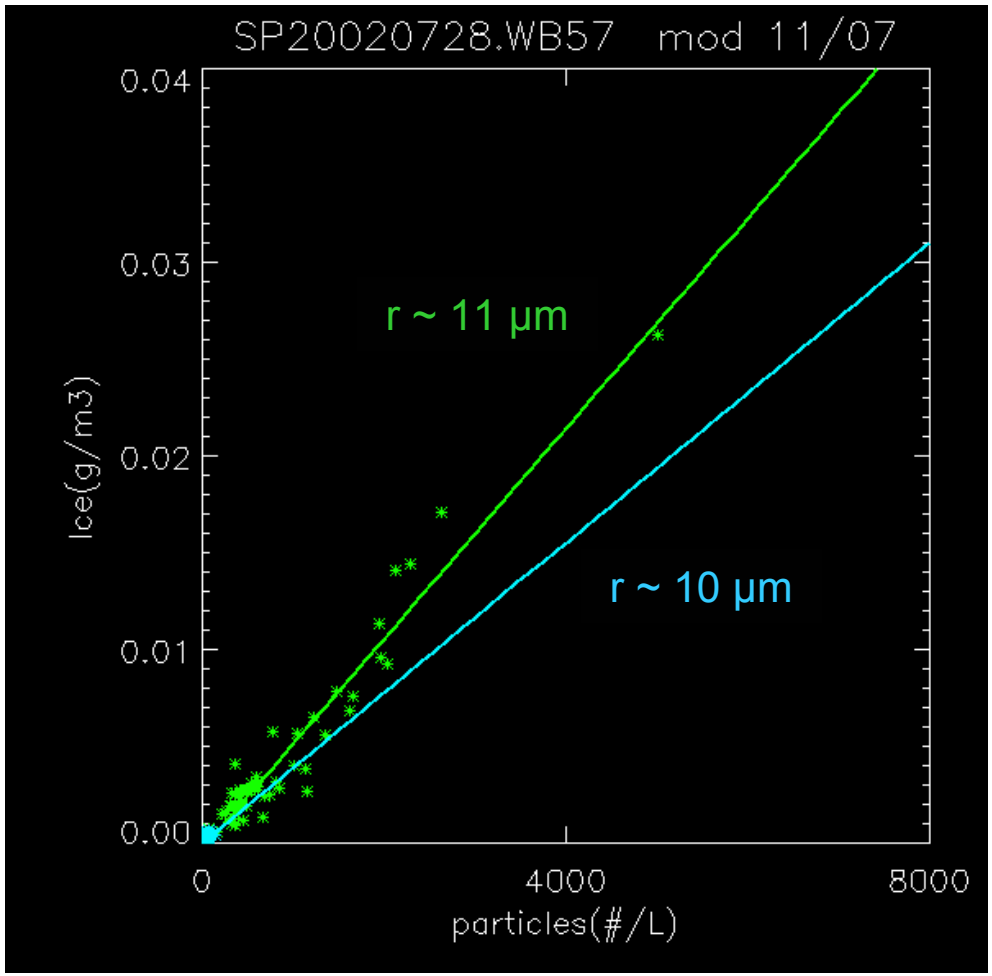
Descent through anvil near core

Data WB57



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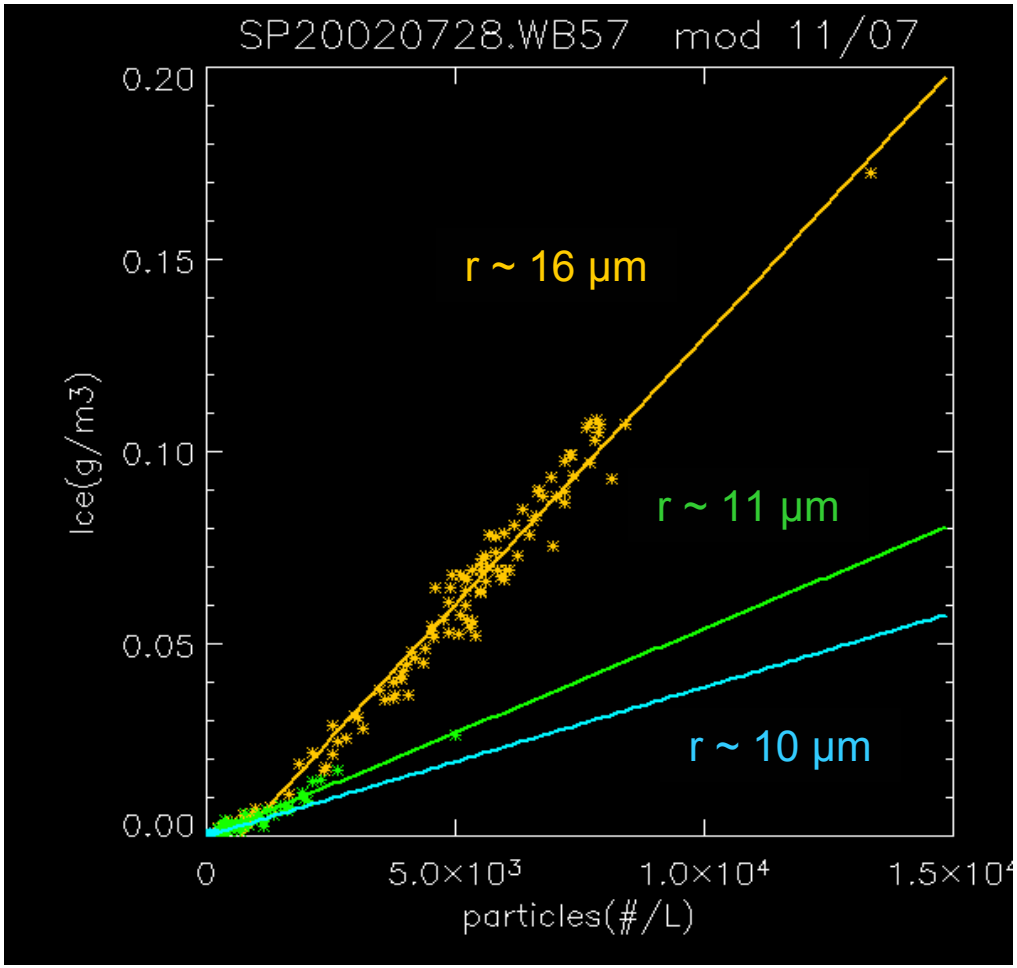
Average particle mass increases

Data WB57



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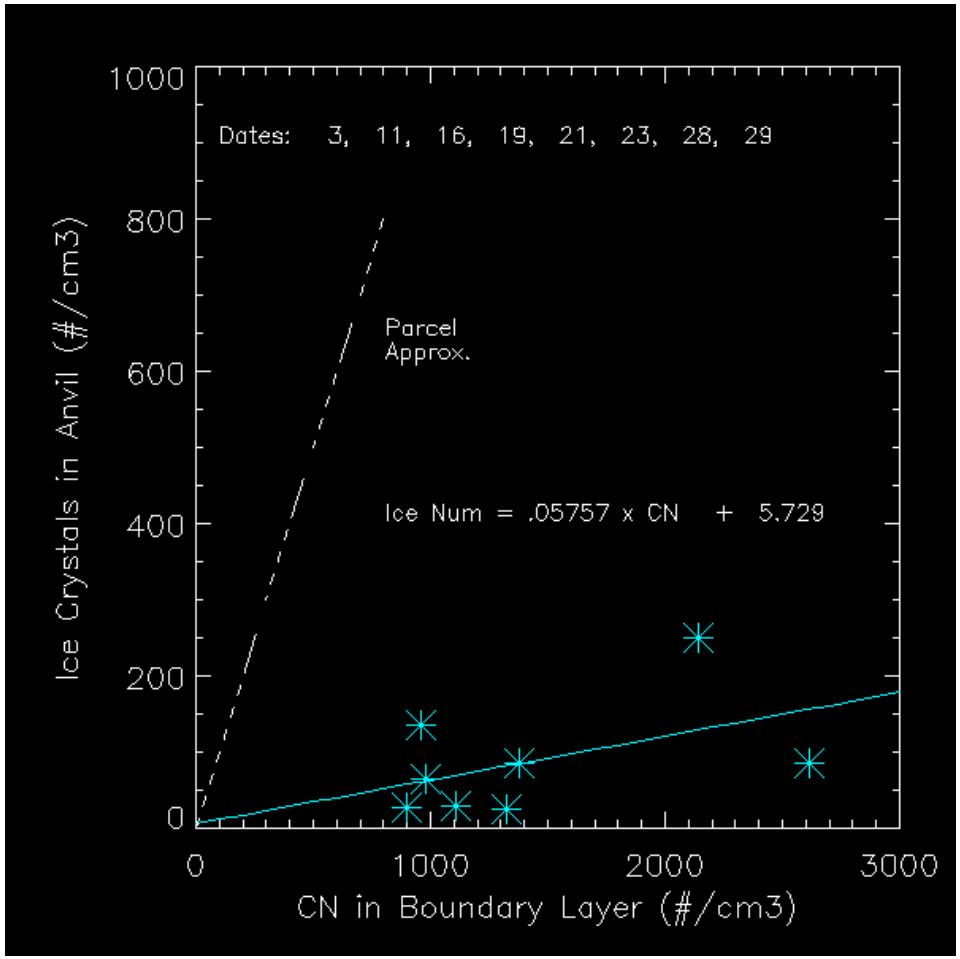
Average particle mass increases again

Ice content decreases as anvil mixes with the environment

Correlation of Ice Crystals with CN



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Deep Convection

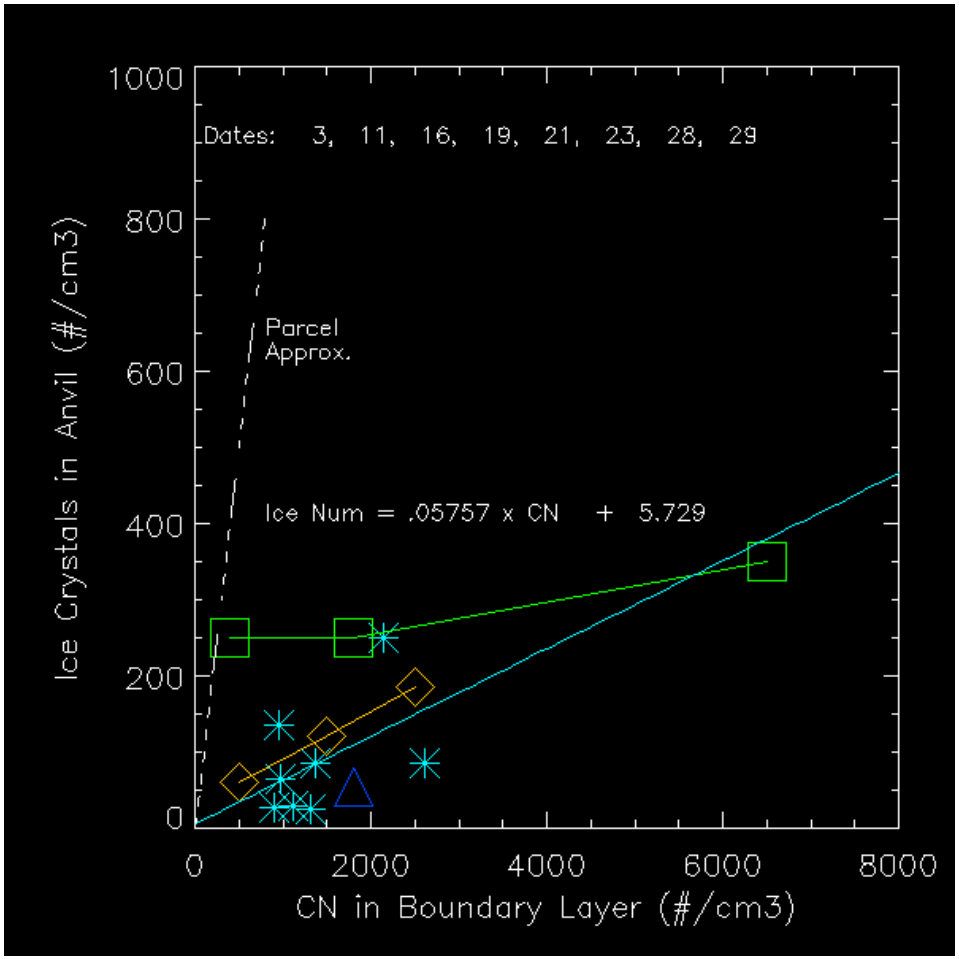
- CARMA: mixed-phase, bin-resolving, microphysical model

- DHARMA: 3-D large eddy simulation model

DHARMA

3-D Animation

Correlation of Ice Crystals with CN



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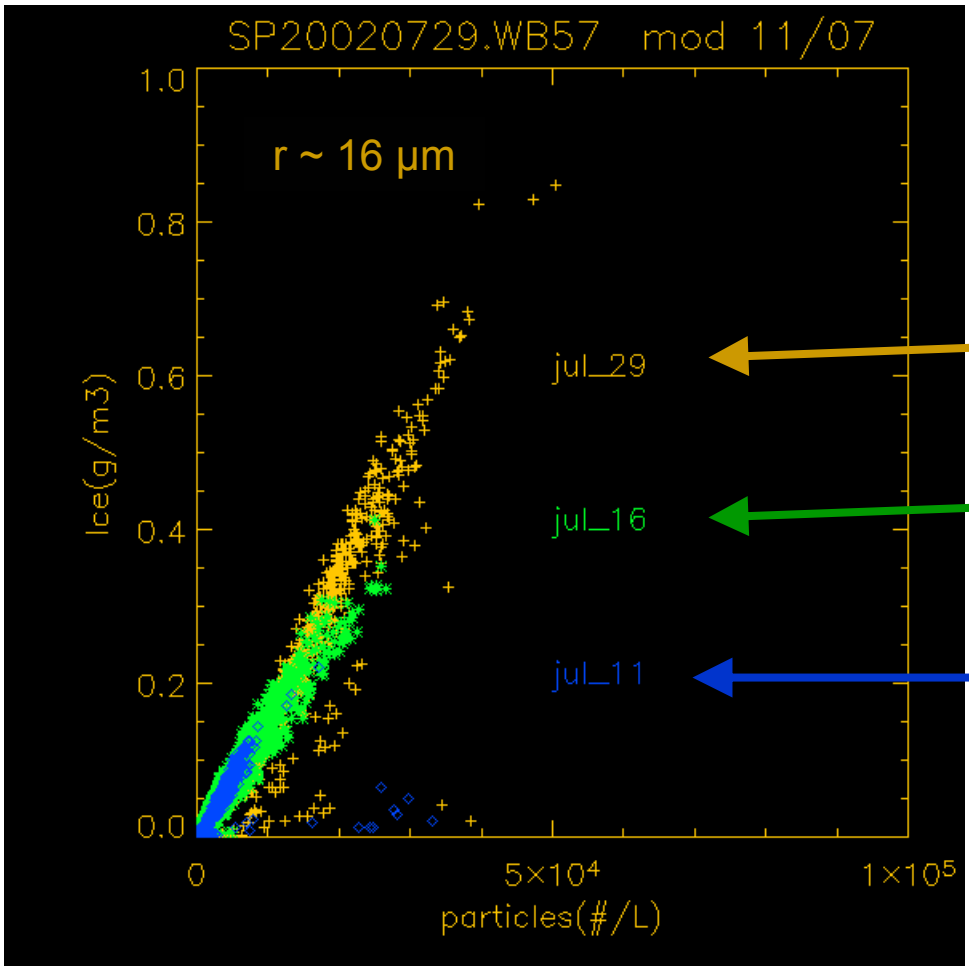
Convective Strength



w_{max} (m/s)

43

28

23

Conclusions

- Tenuous cloud layers present above the anvil
- Aerosol from both the boundary layer and the free troposphere contribute to the ice crystal number concentration in the anvil
- 16 μm mode dominates the number concentration in anvils
- Competition between vertical transport and coalescence determines the number concentration of 16 μm mode

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